British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Minerals, markets and open access

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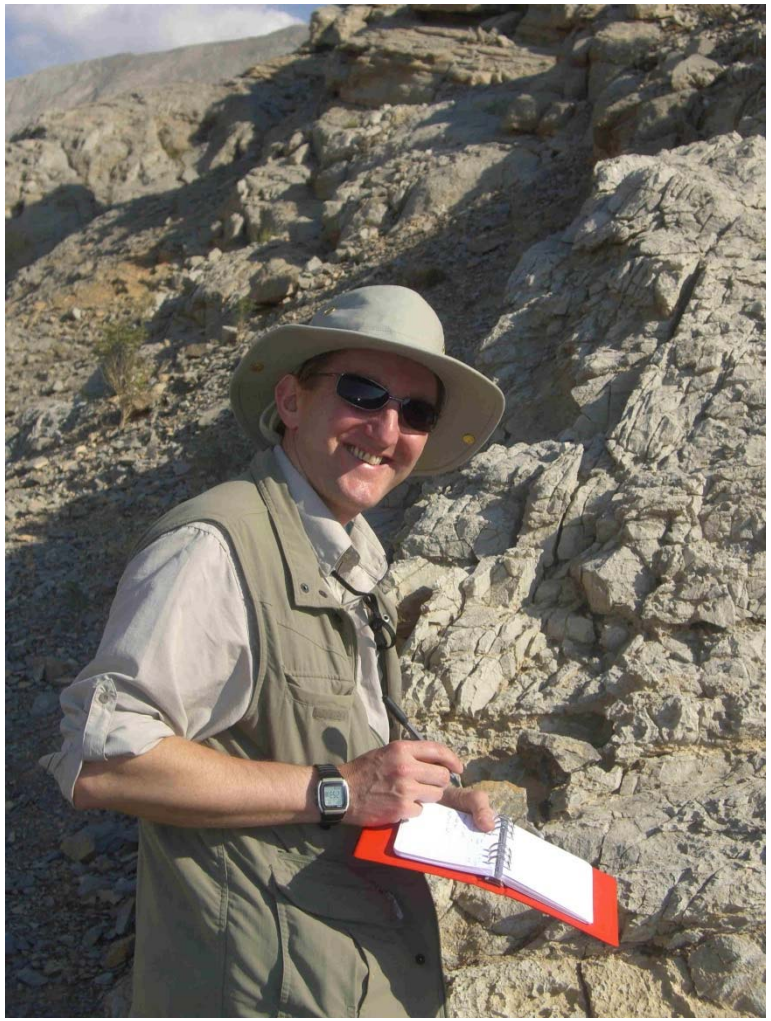
Outline of presentation

- Minerals at the BGS
- Key concept – Minerals for Markets
- Key concept - Specifications
- Key concept – Reserves and Resources
- Minerals information delivery
- Conclusions

British Geological Survey (BGS)

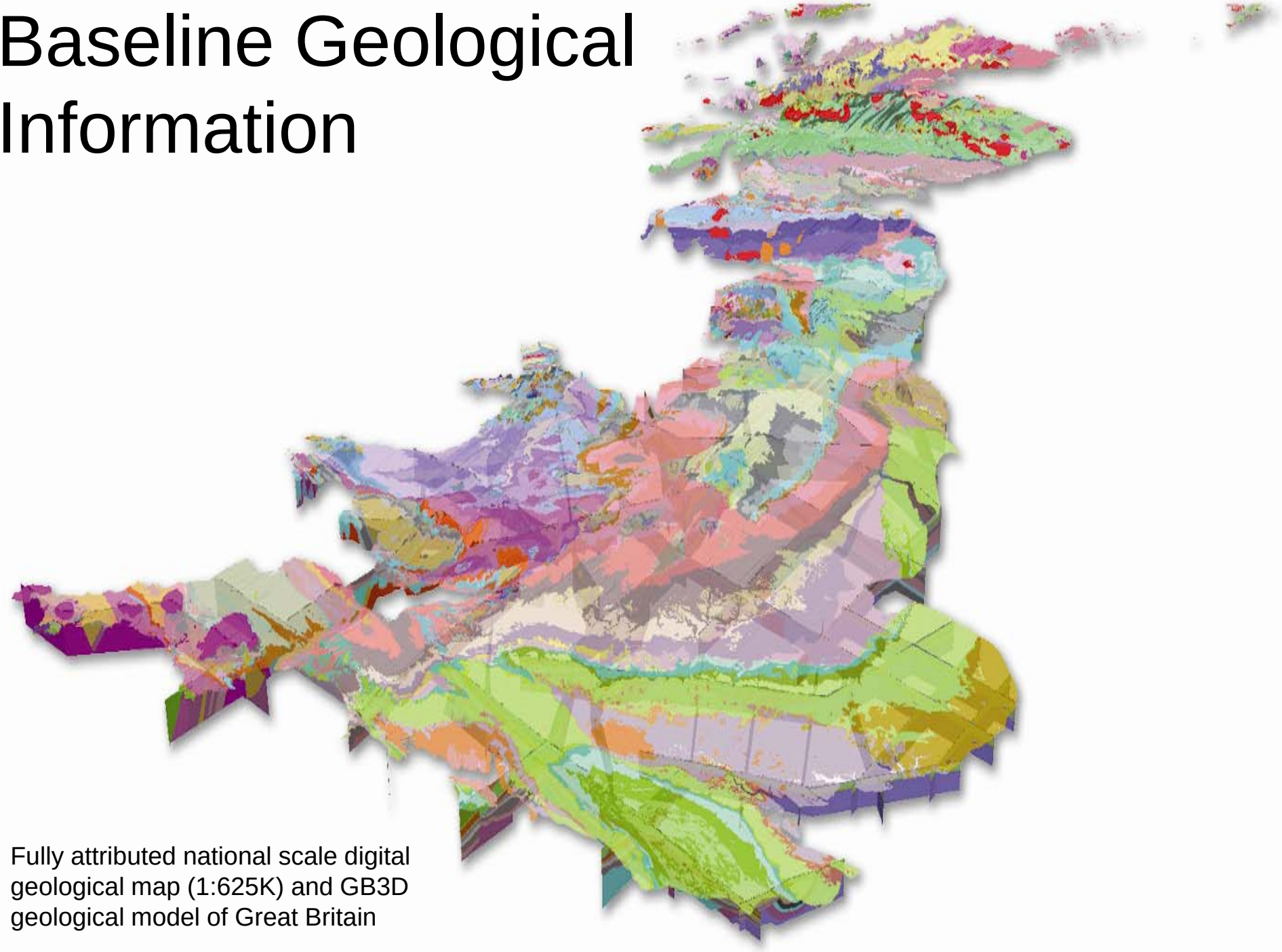
- BGS is a world-leading survey focussing on public-good science & research to understand earth & environment
- Annual budget of £50 million
- 640 staff, of which 520 scientists
- 20 science laboratories
- 150 private-sector clients
- Vision, a global geological survey using new technology and data to understand and predict the geological processes that matter to peoples lives and livelihoods

Minerals at the British Geological Survey



- The traditional A-Z ‘inventory’ of mineral resources from andalusite and anhydrite to zeolite and zircon is no longer appropriate
- The BGS focus is on:
  - Those minerals in demand for national & international markets
  - Planning information, geospatial datasets & digital maps
  - Production & trade statistics
  - Commodity information for government, industry & the public

Baseline Geological Information



Fully attributed national scale digital geological map (1:625K) and GB3D geological model of Great Britain

Key concept 1 - Minerals for Markets

- Employ experienced minerals geologists, technical specialists and GIS experts
- Identify mineral needs of existing markets – local, regional and international
- Contact and visit consumers – get to know their needs and industrial specifications
- Survey existing mineral occurrences and evaluate their industrial potential
- Create Minerals Occurrence Database (MOD) linked to a Geographical Information System (GIS)
- Produce commodity profiles, resource maps, planning factsheets and mineral statistics
- Publish online, make freely accessible (‘Open Access’) to all at no cost

Key concept 2 - Specifications

- Industrial minerals have diverse uses based on their mineralogical, chemical and physical properties
- They are traded on the basis of specific properties, sometimes to meet a particular customers needs
- A specification is a technical requirement drawn up between a producer and consumer
- For example lets consider some basic construction material properties and a more detailed look at glass sand specifications

Construction aggregate (1)

Smooth gravel road constructed from correctly graded aggregate (good blend of coarse and fine material, good particle packing leads to solid road)

Rutted gravel road constructed from incorrectly graded aggregate (too much coarse material, poor particle packing leading to segregation and road failure)

Construction aggregate (2)

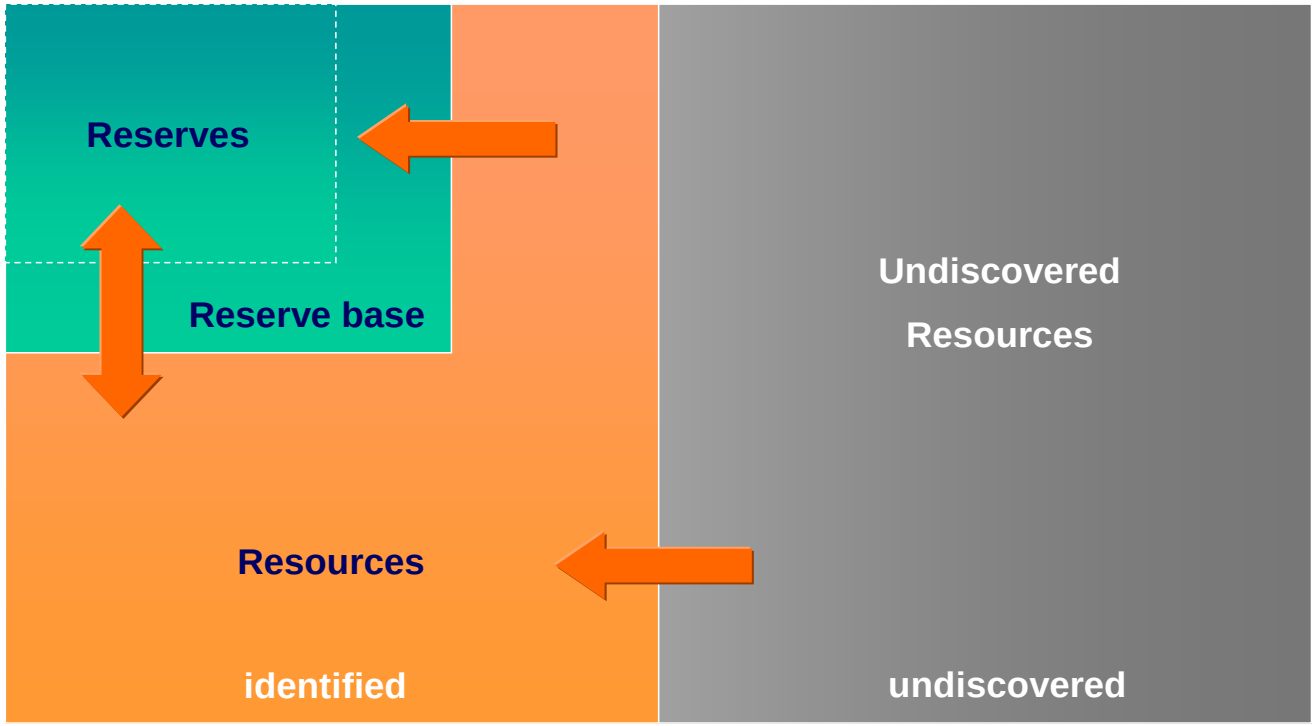
Stripping of stone chippings from surface of road caused by dust/ clay coating on aggregate particles

Glass sand properties

Property	Colourless (Flint) glass containers	Flat glass (Float, sheet & rolled plate)	Coloured (Amber & green) glass containers
Silica (SiO_2) content	98.5 to 99%		
Iron (Fe_2O_3) content	<0.035%	0.04 - 0.1%	0.25 - 0.3%
Alumina (Al_2O_3) content	0.5% max.	0.03% max.	0.2 – 1.6%.
Limits on:	Alkalis (Na_2O & K_2O), colourants (Ni, Cu, Co) & refractory minerals (chromite, ilmenite, zircon, rutile, corundum etc...)		
Particle-size	0.1 to 0.6mm (100 to 600 microns)		
Particle-shape	Angular quartz grains may aid melting?		

Key concept 3 – reserves & resources

not to scale

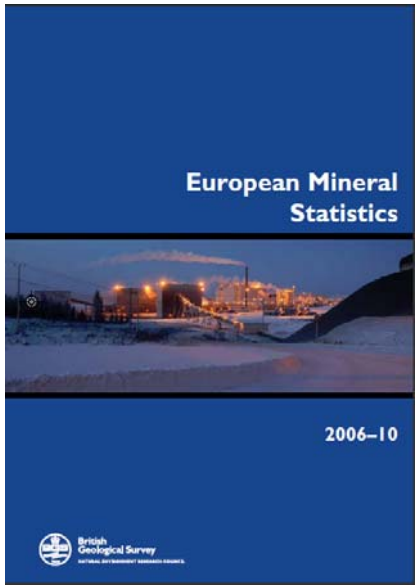


- a ***'mineral resource'*** is a natural concentration of minerals or a body of rock that is, or may become, of potential economic interest as a basis for the extraction of a mineral commodity. A resource has physical and/or chemical properties that makes it suitable for specific uses and it is present in sufficient quantity to be of intrinsic economic interest
- a ***'mineral reserve'*** is the part of the resource which has been fully geologically evaluated and is commercially and legally mineable

MineralsUK

Centre for sustainable mineral development

- A global leader in the compilation, provision and analysis of mineral statistics
- The major UK national provider of spatial and statistical minerals information
- Carries out research in areas such as metallogenesis, land-use impacts of mineral extraction, resource security and geomaterials.
- www.mineralsUK.com



Welcome to MineralsUK

MineralsUK is the British Geological Survey's Centre for Sustainable Mineral Development. This website has a wealth of information on mineral resources, mineral planning, policy and legislation, sustainable development, statistics and exploration.

Minerals & you

Economic minerals – here you will find out what they are, where they come form and why they are important.

Top downloads

1.Risk list 2011

2.World Mineral Production 2005-2009

3.Cement Raw Materials

//Whats new

World Mineral Production 2006-2010
The latest edition of this long-running series is now available.

more info

//Whats new

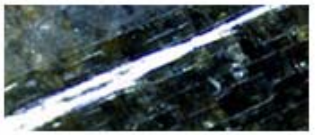
Rare Earth Elements Profile updated
This publication is now available for download.

more info

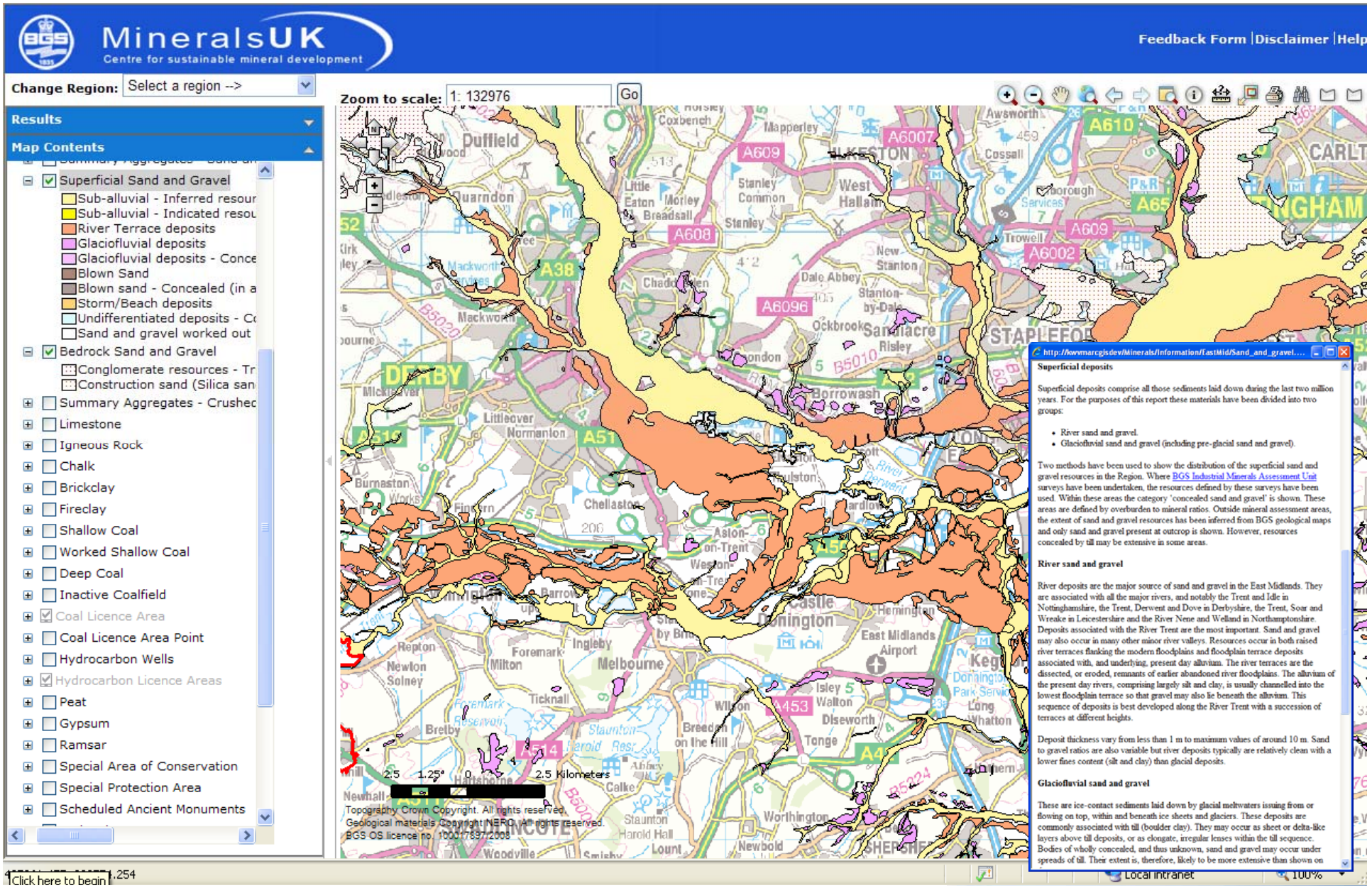
//Downloads

Risk list 2011
A new supply risk index for chemical elements or element groups which are of economic value.

more info



Online Minerals GIS



Mineral Planning Factsheet

- Factsheet on silica sand supply to inform UK land-use planning process & decision makers
- Silica sand is economically important for UK industry, for glass there is no alternative
- Resources may coincide with sensitive environments such as heath land, many disused sites are nature conservation areas
- A scarce resource subject to ‘Mineral Safeguarding’, where possible prior extraction before other land development

Office of the Deputy Prime Minister
Creating sustainable communities

British Geological Survey

Mineral Planning Factsheet

Silica sand

This factsheet provides an overview of silica sand supply in the UK. It is one of a series on economically-important minerals that are extracted in Britain and is primarily intended to inform the land-use planning process.

January 2006

Silica (industrial) sands contain a high proportion of silica (up to 99% SiO_2) in the form of quartz and they are used for applications other than as construction aggregates. They are produced from both loosely consolidated sand deposits and by crushing weakly-cemented sandstones. Unlike construction sands, which are used for their physical properties alone, silica sands are valued for a combination of chemical and physical properties. These include a high silica content in the form of quartz and, more importantly, very low levels of deleterious impurities, particularly clay, iron oxides and refractory minerals, such as chromite. They typically have a narrow grain-size distribution (generally in the range 0.5 to 0.1 mm). For most applications, silica sands have to conform to very closely defined specifications and consistency in quality is of critical importance. Particular uses often require different combinations of properties. Consequently, different grades of silica sand are usually not interchangeable in use. Silica sands command a higher price than construction sands. This allows them to serve a wider geographical market, including exports.

Finished float glass, Pilkington's Greengate plant, St Helens.

Demand

Silica sands are essential raw materials for glassmaking and a wide range of other industrial and horticultural applications. Historically an important market for silica sand was in foundry casting. However, the progressive decline in UK heavy manufacturing, and notably the foundry industry, has resulted in a significant decline in the demand for foundry sand (Figure 1 and 2). In contrast there has been a recent increase in demand for glass sand. In 2004 glass sand accounted for 53% of total sales of silica sand in Great Britain, foundry sand 11%, sand for other industrial uses 19%, and sand for horticultural and leisure uses 17%.

There are many different types of glass with different chemical and physical properties. Most of the commercial glasses in everyday use, such as bottles and jars (containers), and flat glass (windows, mirrors and vehicle glazing), are soda-lime-silica glasses. These contain between 70–74% SiO_2, the ultimate source of which is silica sand, although increasing amounts of silica are being recovered in the form of recycled glass (known as cullet). Sand by itself can be fused to produce glass, but only at very high temperatures (1700°C). The addition of sodium carbonate (Na_2CO_3) significantly reduces this temperature. Other components, such as calcium oxide (CaO), magnesium oxide (MgO) and alumina (Al_2O_3) are added (in the form of limestone, dolomite and feldspathic minerals) in order to give the glass stability and durability. Sodium carbonate is manufactured from salt and limestone, emphasising the dependence that some industries have on a number of industrial minerals.

The principal glass products using silica sand include colourless and coloured containers (bottles and jars), flat glass, light bulbs and fluorescent tubes, TV and computer screens, and glass fibre, both for insulation and reinforcement. Glass manufacturers are principally concerned with the chemical composition of silica sands, and particularly iron, chromite, and other refrac-

Conclusions

- **National Importance**: Geological Surveys produce minerals information for all our stakeholders including the Government, industry and the public
- **Informed**: Understanding the industrial requirements and trade in minerals is vital to help inform the information and maps produced by the BGS
- **Open Access**: UK minerals information is freely available on the internet – good for the economic development of UK PLC

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Thank you for your attention

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